

# Convective Process Information from Nadir Pointing Radars Flying in Convoy

Jay Mace

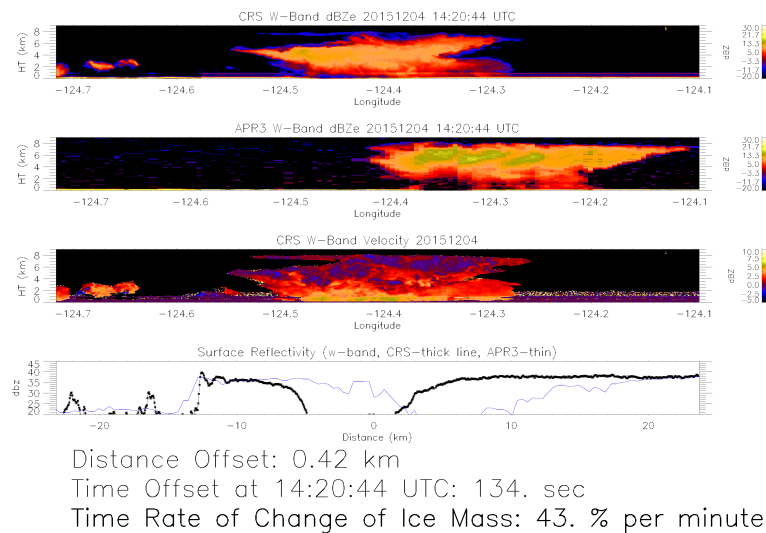
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**Abstract:** Recently Hadaad et al. (2017) and Sy et al. (2017) suggested that significant information regarding convective processes could be obtained from convoys of nadir-pointing spaceborne radars flying in convoy and sampling spatially coincident time differenced radar parameters. In particular, they argue that by exploiting emerging cubesat technology combined with radar component miniaturization, such convoys of radars may be feasible in the near future. We present here a preliminary examination of this idea using actual measurements collected by W-Band radars flying on the ER2 (CRS) and DC8 (APR3) during an Olympex flight that sampled convective showers just offshore of the Olympic Peninsula.

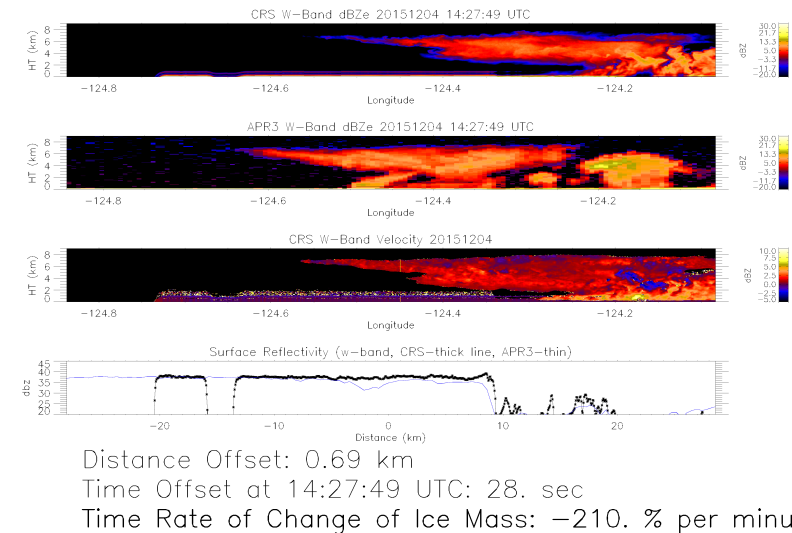
## Method:

1. Coincidences are identified for each CRS lat/lon profile by finding the nearest in space near-nadir APR3 profile.
2. The time offset and distance offset of the two profiles of that point is determined.
3. A scene is constructed by taking 100 CRS profiles on either side of this coincidence point.
4. An APR3 scene is constructed by matching that along track distance.
5. The ice mass in each scene is estimated using the w-band Z-IWC regression relationship of Protat et al. (2007). The IWC is multiplied by the volume of each resolution volume accounting for resolution.
6. The ice mass is summed in each scene and its rate of change determined using finite differences

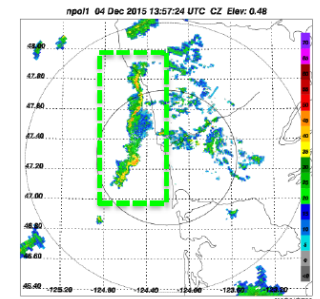
## Westbound Leg



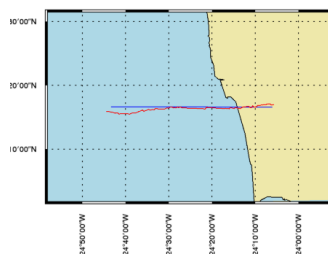
## Eastbound Leg



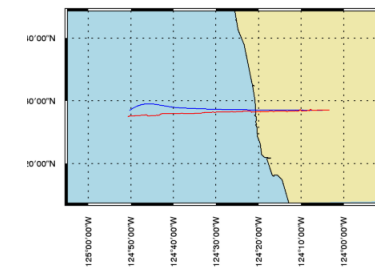
**Case Study:** Post frontal cumulus convection was sampled during the 12/4 flight. The ER2 and DC8 flew closely coordinated tracks with variable time differences during the 14-15 UTC hour. The NPOL radar graphic present the convective line sampled by the airborne radars as it approached the coast near 14 UTC.



**Challenges:** This initial preliminary pilot study suggests that the approach has promise.



The two examples suggest the convective system increasing in intensity during the westbound leg but showing signs of rapid decay ~10 minutes later during the eastbound leg. Note that the updrafts in the upper troposphere decrease in intensity on the eastbound leg.



**Challenges:** Considerable care must be taken in data navigation and processing. Requires additional dedicated measurements to fully demonstrate.